Barriers to Child Maltreatment Evaluation, Diagnosis and Management Among Family Medicine Physicians in the U.S.

By

Kehinde Eniola

A Master's Paper submitted to the faculty of
the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements for
the degree of Master of Public Health in
the Public Health Leadership Program

Chapel Hill

Spring 2016

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ABSTRACT

Objectives

The number of child maltreatment cases in the United States remains high and yet primary care providers such as family medicine physicians lack confidence and training to evaluate, diagnose and manage maltreated children. This study is to provide recommendations to improve family medicine physicians' confidence in the evaluation, diagnosis, and management of child maltreatment (CM).

Methods

Family medicine residents and physicians practicing in the United States (U.S.) were emailed a survey; responses were collected from August through September 2015. Responders were asked questions about their familiarity and competence level in the evaluation, diagnosis and management of child maltreatment. Other questions asked included their frequency of correctly diagnosing cases of CM, timeliness of diagnosis, barriers to diagnosis or early diagnosis, and a question about receiving adequate CM training.

Results

Out of the 420 survey emailed to family medicine residents and practicing physicians in all regions in the U.S., 258 (61%) surveys were completed. The majority of responders stated their level of competence in evaluating, diagnosing and management of child maltreatment as "average" or "below average" with very few (8%) indicating competence level "above average." Very few family medicine physicians and residents diagnose child maltreatment "once a month" or "2-3 times per month", and out of all responders, 46% reported a "timely" diagnosis of child maltreatment while a total of 54% were either "late" with their diagnosis or "could not recall."

"Inexperience" was cited by 58% of respondents as one major barrier to diagnosing child maltreated, followed by "lack of confidence and certainty" cited by 50% of responders, "lack of

diagnosis protocol" cited by 43.3% of responders, and "lack of confidence in communicating with parent" cited by 38.3% of responders. Surprisingly, "inadequate training" was only identified as a barrier by 34.9% of the responding family medicine physicians.

Also, 70% of all responders agreed or strongly agreed that child maltreatment evaluation and management should be completed by other sub-specialty or expert in the field of child maltreatment, in addition to family medicine.

Conclusion

Improving family medicine training in the aspect of child maltreatment by introducing it to residency training curriculum will improve family medicine physicians' confidence and competence level in evaluating, diagnosing and managing of child maltreatment. The child maltreatment curriculum will involve resident completing CM interviewing and examination modules online as well as shadowing clinicians who are experts in the aspect of CM evaluation and management. Developing CM diagnosis protocol by the American Association of Family Physicians (AAFP) will go a long way in improving confidence in the diagnosis of CM as well; this ensures that all physicians follow the same diagnostic protocol.

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LIST OF ABBREVIATIONS

AAFP	American Association of Family Physicians
AAP	American Academy of Pediatrics
CAPTA	Child Abuse Prevention and Treatment Act
CM	Child Maltreatment
CME	Continuing Medical Education
CPS	Child Protective Services
ED	Emergency Department
FMPs	Family Medicine Physicians
HEENT	Head, Eye, Ear, Nose and Throat
MRI	Magnetic Resonance Imaging
PGY	Post Graduate Year
U.S.	United States
WHO	World Health Organization

INTRODUCTION

Children ages less than 18 as defined by the "Convention on the Rights of the Child" [1] are vulnerable to environmental risks such as maltreatment and are unable to protect themselves against all potential environmental risks. [2] Public health practitioners and physicians need to strive to ensure the well-being of all children.

Child maltreatment (CM) is a public health problem that could impose a long-term effect and death of the victim[3]. It can be described harmful or potentially harmful actions taken by a parent or caregiver to a child between the ages of 0 and 18 years, that could be in the form of abuse (i.e., commission) or neglect (i.e., omission).[3] The Child Abuse Prevention and Treatment Act as Amended by P.L. 111-320, the CAPTA Reauthorization Act of 2010 defines child maltreatment as "*any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse or exploitation, or an act or failure to act which presents an imminent risk of serious harm*".[4]

There are various forms of CM (physical abuse, neglect, sexual abuse, and emotional abuse) which will be discussed in detail later. [5] A child can suffer from one or combination of these various types of child maltreatment. [5]

The number of child maltreatment referrals in the U.S. seems to be rising each year. In 2013, the total number of CM referrals to the Child Protective Service (CPS) agency was 3,016,794 out of which 1,837,326 (61%) met the CPS criteria to receive investigation for CM by the agency according to the Children's Bureau (Administration for Children and Families) of the U.S. Department of Health and Human Services 2013 report.[6]

In 2009, the total CM referral rate per 1000 children was 41.6 when compared to 2013 with a rate of 47.1 per 1000 Children suggesting an increase in referrals of more than 10% during this period. [6]

Some maltreated children were not identified early enough until they had suffered significant injuries; hence presenting to the "Emergency Department (ED)", or are dead on arrival to the ED. The national estimated case fatality related to CM as reported by the Children's Bureau in their "Child Maltreatment 2013" report was 1,740 in 2009 at a rate of 2.30 per 100,000 children and 1,520 in 2013 at a rate of 2.04 per 100,000 children; this is an 11% reduction in fatality related to child maltreatment.[6] Apart from fatality, there might be some long-term or fatal consequences associated with CM such as physical injuries with scarring, emotional or psychological issues. [7]

Often the diagnosis of CM is missed by the primary care providers. A substantial proportion of the children seen in the ED for injuries related to maltreatment had been evaluated previously by their primary care physician before their presentation to the emergency department. A study of 173 children showed missed CM cases of 31% of children who were later found to have maltreatment-related injuries[8], children previously misdiagnosed had a re-injury rate of 27% within the reinjured group, 40% presented with medical complications and 9% died before their arrival at the ED.[8] A Canadian retrospective study by Ravichandiran et al. found among 258 children less than 3 years. of age who presented to a large academic children's hospital with an abusive fracture, that 20.9% had, at least, one previous visit to a physician and the case of abuse was missed[9]

This paper will focus on the causes of child maltreatment misdiagnosis by FMPs and potential recommendations to improve early and correct diagnosis and management of CM.

BACKGROUND INFORMATION

Child Maltreatment Types:

Child maltreatment is a term used to describe an action by parent or caregiver that could lead to harm, injury or death of a child [3, 4]. The various types of CM include neglect, physical abuse, emotional (psychological) abuse, and sexual abuse. One or more of each type of child maltreatment can be identified in the same child as earlier mentioned.

Child Neglect:

The most common type of CM across all age groups in the U.S. is child neglect, accounting for 79.5% of all cases nationally according to "Child Maltreatment 2013" report[6]. Child neglect is any form of omission or withdrawal by parent or caregiver of medical care, food, shelter, education, protection, emotion or love from a child, either intentionally or unintentionally, which might lead to an adverse outcome in a child. It also includes failure to provide basic care or supervision of a child. [3, 10, 11]

The consequences of child neglect can be immediate or delayed; immediate effects due to physical neglect or abandonment might include severe injury and death from lack of supervision, while delayed consequences of neglect could include failure to thrive or malnutrition from lack of medical care and food provision and depression, anxiety or conduct disorder due to emotional or psychological neglect. [3, 10, 11]

Child neglect can be of various types such as (a) Physical neglect in which the caregiver or parent fail to provide basic hygiene, nutrition, shelter or clothing to a child, (b) Emotional neglect in which parent or caregiver fails to offer emotional or psychological support to a child, (c) Medical neglect in which parent or caregiver withholds basic health care services for a child, (d) Educational neglect in which parent or caregiver fails to provide access to schooling and or special education need, (e) Inadequate supervision, and (f) Exposure to a violent environment. [3, 10, 11]

Physical Abuse:

According to the World Health Organization (WHO), physical abuse can be defined as "*the intentional use of physical force against a child that results in or has a high likelihood of resulting in harm to the child's health, survival, development or dignity*".[12] Physical abuse is usually in the form of hitting, kicking, beating, choking, shaking, etc., and the perpetrator is often one or both parents or a caregiver.[12] Nationally approximately 18% of U.S. children were physically abused, making it the second most common form of maltreatment,[6] and 1-2 per 1000 U.S. children are physically abused every year.[13] Physically abused children commonly present to their physician with bruising, skin ulcers at different stages of healing, swelling, burn injury, fracture, and trauma to the head.[5]

As with neglect, consequences of physical abuse can be immediate or delayed; however physical maltreatment has a higher propensity for immediate consequences, such as death when compared to neglect which is subtle.

Emotional abuse:

Emotional abuse involves repeated acts of a parent or caregiver toward a child that convey negative messages that they are: worthless or of value only in meeting other's needs; flawed; unwanted; unloved; or even endangered, as defined by the American Professional Society on the Abuse of Children in their 1995 guidelines. [14, 15] It involves verbal or nonverbal degradation, bullying, terrorizing or exploitation. [14, 15] Emotional abuse can be as a form of emotional neglect as mentioned earlier especially when there is a denial of the opportunity to be loved or opportunity for parental interaction.

Sexual Abuse:

The World Health Organization and the International Society for Prevention of Child Abuse and Neglect in their 2006 publication defined sexual abuse as "*the involvement of a child in sexual activity that he or she does not fully comprehend, is unable to give consent to, or for which the child is not developmentally prepared, or else that violates the laws or social taboos of the society*".[12] Sexual abuse is a relatively common form of CM accounting for approximately 9% of all cases in the U.S.[6]

Risk Factors for Child Maltreatment

It is important for physicians to be aware of and understand various risk factors for CM to identify promptly at-risk children. Risk factors that contribute to child maltreatment include but not limited to the following:

1. Age, the younger the age, the higher the risk for child maltreatment. [16] The 'Child Maltreatment 2013' report indicated that 27.3% of victimized U.S. children were less than three years old while 19.7% of victimized children were 3-5 years. [6]

2. Disability, children with any form of disability (mental, emotional, physical, learning, etc.), are at high risk for maltreatment by their caregivers. [6, 16]

3. Parent or caregiver with a history of childhood maltreatment. [16]

4. Parent or caregiver's unemployment status and financial instability. [16] In a national survey, 14.4% of CM victims had caregivers with financial instability when compared with 8.8% of non-victims with a caregiver with financial instability. [6]

5. Parent or caregiver with a history of mental health problems such as depression or anxiety. [16]

6. Parent or caregiver with domestic violence problem. [16] The 'Child Maltreatment 2013" report indicated that for parents or caregivers with a domestic violence history, 27.4% of their children were a victim of maltreatment compared to 8.1% who were non-victim of CM. [6]

7. Parental substance abuse. [16]

8. Poor parental education status. [16]

Diagnosis of Child Maltreatment

Recognizing signs and symptoms of CM is important for early and correct identification of children at risk for CM. Also, promptly reporting suspected cases to an appropriate authority – that will then investigate reported cases and assess if these children will need help or protective intervention – is equally as important. [5] There are specific signs and symptoms a clinician should look for in suspected cases of CM; these are well described by "Child Welfare Information Gateway" based on types of CM. [5]

Child Neglect:

A neglected child might present with one or more of the following signs [5];

1. Perpetual school absenteeism.
2. Change in school performance or grades from good to bad.
3. Change in behavior.
4. Act of stealing or begging for food or money.
5. Inadequate or absent health care.
6. Poor hygiene.
7. Poorly groomed child.
8. Inappropriately dressed for a particular weather condition.

Physical Abuse:

A physically abused child might present with the following signs [5];

1. A recurrent, unexplained traumatic injury such as burns, bites, bruises, fractures, etc.
2. Bodily injuries or bruises at different stages of healing.
3. Expression of fear and anxiety around parent or caregiver.
4. Report of parental or caregiver abuse.
5. An act of animal cruelty.

Emotional Abuse:

A child suffering from emotional abuse may present with the following signs [5];

1. Suicidal ideation.
2. Acting age inappropriate either by parenting other children or acting less than their age or infantile.
3. Emotional, physical, and/or developmental delay.

4. Lack of child-parent emotional bond.

Sexual Abuse:

The follow signs may indicate sexual abuse in a child [5];

1. Obvious discomfort with sitting or walking.
2. Refusal to undress in the presence of strangers.
3. Bedwetting.
4. Report of nightmares or night horror.
5. Bizarre sexual behavior.
6. An advanced sexual knowledge or awareness that is above child's age.
7. Diagnosis of sexually transmitted infection especially in children less than 14 years.
8. Child pregnancy especially in children less than 14 years.
9. Self-report of parental or caregiver sexual abuse.

The above-listed signs provide a guide to identification of CM and may not be a complete list; it is important for FMPs to pay attention to any suspicious signs or symptoms that might warrant reporting to an appropriate authority. [5]

Physical examination is important in the diagnosis of child maltreatment and performing a full body examination is crucial to correct and prompt diagnosis of child maltreatment. Some important physical examination findings suggestive of child maltreatment include:

1. Constitutional: Muscle wasting that is indicative of malnutrition mostly secondary to child neglect. [17,18,19]
2. Skin: Bruises, burns, and scars at different healing stages. [17,18,20]

3. Head, Eye, Ear, Nose and Throat (HEENT): Findings may include facial bruising, swollen lips or missing teeth from facial trauma and hematoma. Tympanic membrane ruptures from forceful, blunt trauma to the ear. Acute loss of visual acuity, as well as optic fundus or retinal hemorrhage, may be suggestive of CM. [17,18,19]
4. Respiratory/Chest: This can reveal pain or tenderness with palpation of the chest wall and rib cage suggesting rib fracture. [17]
5. Cardiovascular: Abnormality in cardiac assessment might suggest a chronic illness for a maltreated child. [17]
6. Gastrointestinal: Abdominal distention and tenderness can indicate blunt trauma to the stomach inflicted by the perpetrator on the child leading to rupture of intra-abdominal organs such as the liver and the spleen. [18,21]
7. Anogenital: The perineum and genital organ may be swollen, erythematous or lacerated suggestive of forceful sexual contact; there might be the presence of vaginal or penile discharge in a child suggestive of sexually transmitted infection. [18,22]
8. Musculoskeletal: Asymmetry of all extremity or failure to move a part of the limb might suggest musculoskeletal injury. [17]
9. Neurological: Abnormality of the nervous system might suggest brain injury from repetitive traumatic head injury. [17]
10. Psychological: Change in the facial mood of a child might suggest maltreatment; these children may present with a flat affect or may be tearful. [17]

Laboratory and imaging studies are important in evaluating and diagnosing child maltreatment; many of these children may present with various laboratory and imaging abnormalities. A summary of key tests may include:

1. General test: Blood test including a complete blood test, serum electrolyte, coagulation profile, and urine test. [18,23]
2. A test based on the type of abuse: Urine pregnancy test, sexually transmitted infection screening test (i.e., HIV and Chlamydia), and genital secretion analysis for residual sperm in sexually abused children. [18]
3. Radiologic testing: Check for bone fracture, head trauma or subdural hematoma using x-ray, computed tomography and Magnetic Resonance Imaging (MRI). [17,18]

Despite the risk factors for child maltreatment and growing number of reports in the United States, I hypothesize that family medicine physicians lack confidence and adequate training regarding evaluation, diagnosis, and management of CM. Information regarding family medicine physicians' competency and knowledge about evaluation, diagnosis, and management of CM was gathered to investigate this hypothesis.

METHODS

I used "Qualtrics Software" to design an online survey and administered to a total of 420 family medicine residents and practicing physicians via email. A convenience sampling approach was used. Subject selection is from the "American Association of Family Physician (AAFP)" website contact listing for all U.S family medicine residency programs. Responses were collected between August to September 2015.

Clinicians' email addresses not listed on their program's website were ineligible for this study. Before emailing the survey to clinicians, approval was sought from the University of North Carolina Institutional Review Board that determined the survey to be exempt from further review, as it was classified as "Survey, interview, public observation." At the beginning of the questionnaire a description of the instrument was provided and informed consent was obtained from respondents answering the survey questions.

Data variables collected include demographic data such as the level of practice (i.e., resident or practicing physician), age, gender, race, practice type (i.e., academic institution or residency program, private, government hospital, nursing home and federally qualified health center). I also obtained practice location (i.e., urban, rural or suburban) data.

Other variables include questions about one's self-reported familiarity, the level of competence, frequency of diagnosis, promptness in diagnosing, barrier(s) to diagnosing, and training in evaluating, diagnosing and managing of CM. I asked the question as to whether the evaluation and diagnosis of CM should be carried out by subspecialties other than FMPs. Descriptive statistics were prepared using Microsoft Excel to describe the responding survey sample; frequencies and percentages summarized categorical variables produced from the multiple choice survey questions. I further analyzed each response in four different categories based on the level of practice experience, i.e., Post Graduate Year (PGY) 1, PGY 2, PGY 3 and Post-Residency/practicing physicians and then also by practice location. Physicians' familiarity, competence and confidence level in management of CM was reported based on these practice experience subgroups. See Appendix 2 for the survey tool.

RESULTS

Demographic Data: Table 1

Out of the 420 surveys emailed, a total of 271 (65%) surveys were started, a total of 258 (61%) surveys were completed, and of those who completed, 159 (62%) of these responders were family medicine residents while post-residency FMPs (i.e., both academic and private practice physicians) completed the rest.

The majority of the responders were female (66%), and approximately 40% of responders were within the age range of 30-39 years, 36% were in the age range of 20-29 years, 5% were 60 years and older while none were less than 20 years of age. Note that of the 258 responders one responder omitted the question about age range.

The majority of the responders were from an academic institution or residency program accounting for 94% of all responders, 2% were from private practice while 3 % were from other practice types (Federally Qualified Health Center, Nursing Home, PACE/ Program for All-Inclusive Care for Elderly). A majority (55%) of the FMPs responders practice in an urban location; 32% reported practicing in a suburban location while the remaining 13% practice in a rural setting. This geographic distribution gives a good mix of all practice locations, and this information can be used to determine the relationship between practice location and experience with child maltreatment management. Responders' geographical location correlates with the "Agency for Healthcare Research and Quality Date" 2010 U.S FMPs geographical location report as derived from the 2008 "U.S Census Bureau" population estimate. They reported 77.5% of FMPs practicing in urban location while a total of 22.5% practice in a rural location. [24] Note that all responders were U.S practicing physicians.

Table 1: Responders' Demographic Data

Demography Questions		Which of the following describes your practice level?				
		PGY 1	**PGY 2**	**PGY 3**	**Post Residency**	**Total**
What is your gender?	Male	14	19	11	42	86 (33.3%)
	Female	43	33	37	57	170 (65.9%)
	Transgender	0	0	0	0	0 (0%)
	Prefer not to say	1	0	1	0	2 (0.78%)
Total		58	52	49	99	258
Age in years	Less than 20	0	0	0	0	0 (0%)
	20-29	42	29	20	2	93 (36.2%)
	30-39	14	20	26	44	104 (40.5%)
	40-49	1	3	2	25	31 (12.1%)
	50-59	1	0	0	15	16 (6.2%)
	60 & above	0	0	0	13	13 (5.1%)
Total		58	52	48	99	257
Practice Type	Private Practice	0	2	0	2	4 (1.6%)
	Residency Program	55	50	48	90	243 (94.2%)

	Government Hospital	2	0	0	1	3 (1.2%)
	Other	1	0	1	6	8 (3.1%)
Total		58	52	49	99	258
Practice Location	Urban	23	26	32	62	143 (55.4%)
	Rural	8	11	5	9	33 (12.8%)
	Suburban	27	15	12	28	82 (31.8%)
Total		58	52	49	99	258

Familiarity and Competence Level: Table 2 and 3

The survey assessed physicians' self-reported competence level in diagnosing CM as well as their familiarity with the diagnosis of CM among all 258 responders. However, only 250 responded to these particular questions since the survey did not require a response to each question. Out of the 250 responders the majority (52%) indicated that they were somewhat familiar, approximately 23% stated they were familiar with child maltreatment diagnosis while the remaining (25%) were either unfamiliar or somewhat unfamiliar. Most of the physicians surveyed stated their competency level in evaluating and diagnosing CM to be average (74.4%), 8% self-reported with a competency level above average, while about 18% indicated their competency level below average.

It is not surprising that familiarity and competence level were found to be higher among post-residency FMPs when compared to residents. Among post-residency physicians (n=99), 31% were familiar with a diagnosis of child maltreatment, unlike PGY 1 residents with only 18.5% responding with "familiar", PGY 2 with only 12.2% and PGY 3 with 22.9% reporting that they were familiar with CM diagnosis. Similarly, 14.4% of post-resident family medicine physicians self-reported that they have above average level of competency when compared to responders in the other practice levels; PGY 1 with 1.9%, PGY 2 with 6.1%, and PGY 3 with 4.2% responding at an above average level of competence.

Table 2: Familiarity

		Which of the following describes your practice level?				
Familiarity with the diagnosis of child maltreatment		**PGY 1**	**PGY 2**	**PGY 3**	**Post Residency**	**Total**
	Not at all familiar (% by practice level)	3 (5.6%)	0 (0.0%)	2 (4.17%)	1 (1.01%)	6 (2.4%)
	Somewhat unfamiliar (% by practice level)	19 (35.2%)	13 (26.5%)	9 (18.8%)	15 (15.2%)	56 (22.4%)
	Somewhat familiar (% by practice level)	22 (40.7%)	30 (61.2%)	26 (54.2%)	52 (52.5%)	130 (52%)
	Familiar (% by practice level)	10 (18.5%)	6 (12.2%)	11 (22.9%)	31 (31.3%)	58 (23.2%)
Total		54	49	48	99	250

Table 3: Competence Level

		Which of the following describes your practice level?				
Competence level in diagnosis of child maltreatment		**PGY 1**	**PGY 2**	**PGY 3**	**Post Residency**	**Total**
	Below average (% by practice level)	20 (37.0%)	8 (16.3%)	6 (12.5%)	10 (10.1%)	44 (17.6%)
	Average (% by practice level)	33 (61.1%)	38 (77.5%)	40 (83.3%)	75 (75.8%)	186 (74.4%)
	Above average (% by practice level)	1 (1.9%)	3 (6.1%)	2 (4.2%)	14 (14.1%)	20 (8%)
Total		54	49	48	99	250

Frequency of Diagnosis of Child Maltreatment: Table 4

Among all 258 physicians who completed the survey, 250 responded to the question about the frequency of diagnosis of CM. The frequency of diagnosis of CM among these clinicians was low across the board with a majority of them diagnosing CM "once a year or less" or had "never" made a diagnosis (44.8% and 23.6% respectively). When divided into the level of practice strata, post-residency FMPs has a higher frequency of diagnosis when compared to most residents, they diagnose CM several times a year 33.3% of the time when compared to PGY1 and PGY3 residents (14.8% and 25% respectively). It is interesting that respondents in the PGY2 subgroup had the highest percentage of frequency of CM diagnosis with 36.7% making the diagnosis of CM several times a year. Similarly, 57.6% of post-residency FMPs diagnose CM "once a year or less" when compared to PGY1, PGY2 and PGY3 residents (27.8%, 28.6%, and 54.7%, respectively).

The majority of PGY1 resident had never diagnosed CM (55.6%) when compared post-residency FMPs (6.1%). The frequency of diagnosis of CM seems to increase as education level increases, the likelihood that a FMP never having made the diagnosis of CM decreases as the education level increases.

TABLE 4: Frequency of Diagnosis of CM

		Which of the following describes your practice level?				
		PGY1	**PGY2**	**PGY3**	**Post Residency**	**Total**
Frequency of diagnosis of child maltreatment	Never (% by practice level)	30 (55.6%)	15 (30.6%)	8 (16.7%)	6 (6.1%)	59 (23.6%)
	Once a year or less (% by practice level)	15 (27.8%)	14 (28.6%)	26 (54.2%)	57 (57.6%)	112 (44.8%)
	Several time/year (% by practice level)	8 (14.8%)	18 (36.7%)	12 (25.0%)	33 (33.3%)	71 (28.4%)
	once a month or more frequently (% by practice level)	1 (1.9%)	2 (4.1%)	2 (4.2%)	3 (3.0%)	8 (3.2%)
Total		54	49	48	99	250

Timeliness: Table 5

Out of 258 responders who completed the survey, only 188 (< 73%) responded to the question regarding the timeliness of diagnosis of CM before presenting to the ED. A total of 46.3% clinicians responded that their diagnosis was timely while a total of 53.7% responded that their diagnosis was either “late” or that they “can’t recall.”

TABLE 5: Timelines to Diagnosis of CM

Timeliness of diagnosis of CM		Which of the following describes your practice level?				
		PGY1	**PGY2**	**PGY3**	**Post Residency**	**Total**
	Yes, timely (% by practice level)	12 (50.0%)	15 (48.4%)	19 (47.5%)	41 (44.1%)	87 (46.3%)
	No late (% by practice level)	0	8 (25.8%)	8 (20.0%)	20 (21.5%)	36 (19.2%)
	Can't recall (% by practice level)	12 (50.0%)	8 (25.8%)	13 (32.5%)	32 (34.4%)	65 (34.6%)
Total		24	31	40	93	188

Barrier to Diagnosis: Table 6

Clinicians (n=238, 92.2%) of all survey respondents) answered the question about their perceived barriers to diagnosing or early diagnosing of child maltreatment. The majority of the clinicians who responded (58%) cited lack of experience in diagnosing and treating child maltreatment, 50% cited "lack of confidence and certainty" in identifying maltreated child, 43.3% cited lack of clinic protocol in diagnosis of child maltreatment, 38.2% noted "lack of confidence in communicating with parent", and 34.9 % cited inadequate professional training.

Physician's cultural background and the language barrier were not so much of a barrier in diagnosing child maltreatment; from the survey, only 3.8% cited cultural background as an issue while 6.7% cited language barrier as an issue regarding diagnosing of child maltreatment. 7.6% of responders listed other factors contributing to diagnosis or delayed diagnosis that included lack of expertise in conducting a physical exam, difficulty in interrogating parents who are also their patient, limited social worker support or child protective services resources.

For this question responders could choose more than one answer hence the total response percentage was more than 100%.

The barrier to diagnosis when broken down by practice level as seen in Table 6a and Figure 1 shows inconsistent variation in response across all level except for the barrier of "Inexperience." 76.5% of PGY 1 resident cited "Inexperience" in the diagnosis of CM, 68.9% of PGY 2 resident, 60.9% of PGY 3 resident and 41.7% of Post-resident physicians cited "Inexperience" as a barrier; this shows a consistent decline in inexperience as the level of training increases.

TABLE 6a: Barrier to Diagnosis of CM by Practice Level.

		Which of the following describes your practice level?				
		PGY1	**PGY2**	**PGY3**	**Post Residency**	**Total**
Barrier to diagnosis of child maltreatment	Inadequate training (% by practice level)	16 (31.4%)	17 (37.8%)	15 (32.6%)	35 (36.5%)	83 (34.9%)
	Lack of confidence and certainty (% by practice level)	22 (43.1%)	24 (53.3%)	25 (54.4%)	48 (50%)	119 (50%)
	Inexperience (% by practice level)	39 (76.5%)	31 (68.9%)	28 (60.9%)	40 (41.7%)	138 (58%)
	Inadequate time for physical examination (% by practice level)	6 (11.8%)	8 (17.8%)	10 (21.7%)	21 (21.9%)	45 (18.9%)

	Lack of confidence in communicating with parent (% by practice level)	20 (39.2%)	22 (48.9%)	20 (43.5%)	29 (30.2%)	91 (38.2%)
	Lack of diagnosis protocol (% by practice level)	14 (27.5%)	16 (35.6%)	29 (63.0%)	44 (45.8%)	103 (43.3%)
	Physicians' cultural background (% by practice level)	1 (1.96%)	1 (2.2%)	2 (4.4%)	5 (5.2%)	9 (3.8%)
	Language barrier (% by practice level)	4 (7.8%)	1 (2.2%)	2 (4.4%)	9 9.4%)	16 (6.7%)
	Other (% by practice level)	2 (3.9%)	2 (4.4%)	1 (2.2%)	13 (13.5%)	18 (7.6%)
Total		51	45	46	96	238

FIGURE 1: Reported Barriers to Diagnosis of CM by Practice Level

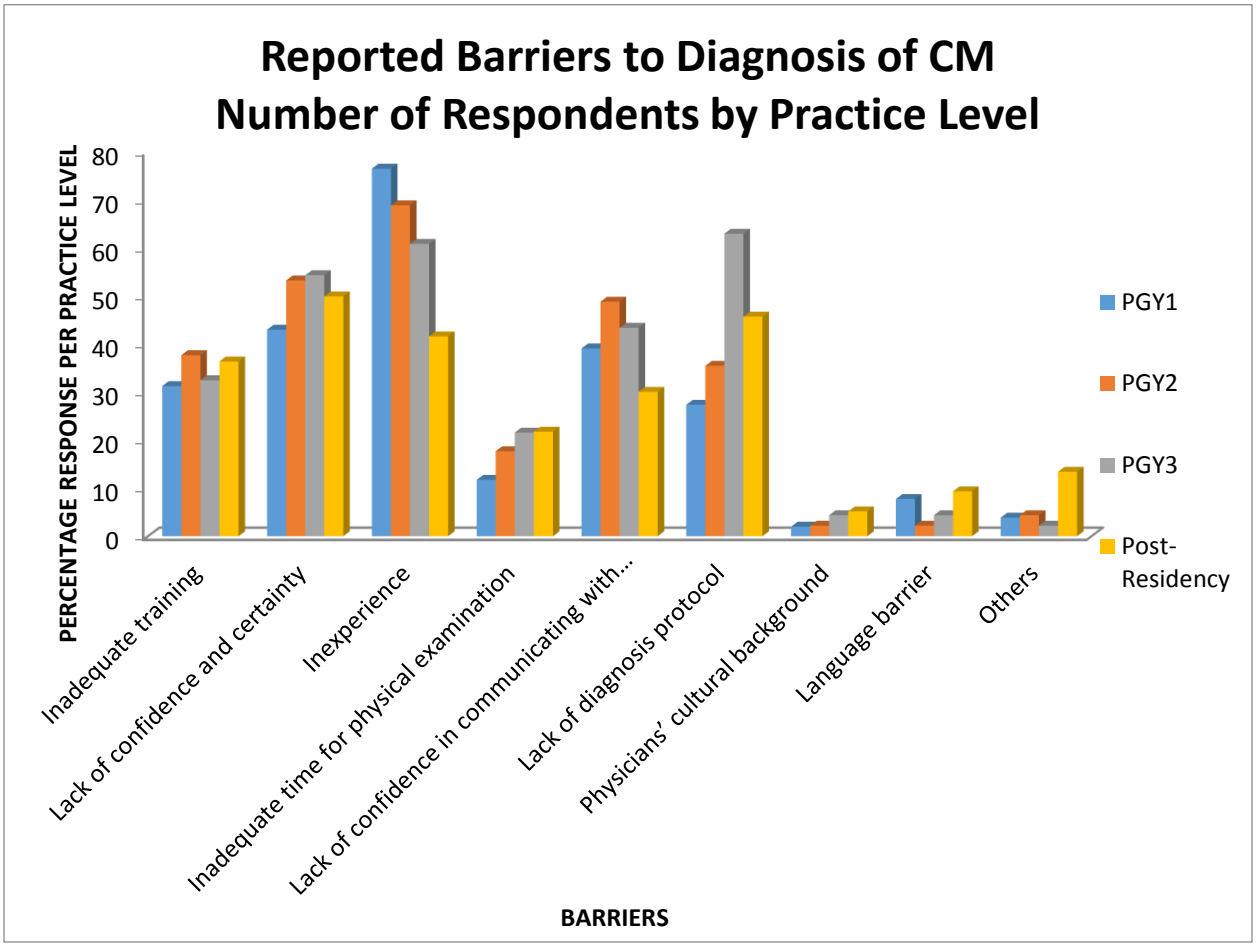


Table 6b and Figure 2 shows barrier to the diagnosis of CM by practice locations. 57.5% of physicians in the urban area cited inexperience as a barrier, 51.7% and 61.4% cited inexperience in rural and suburban location respectively. Lack of confidence and certainty was more of a barrier in both suburban (47.1%) and urban (54.7%) area than in rural area (34.5%). For lack of clinic protocol for diagnosis of CM, 41.7% in the urban location, 51.7% in the rural location and 42.9% in suburban location cited this as a barrier.

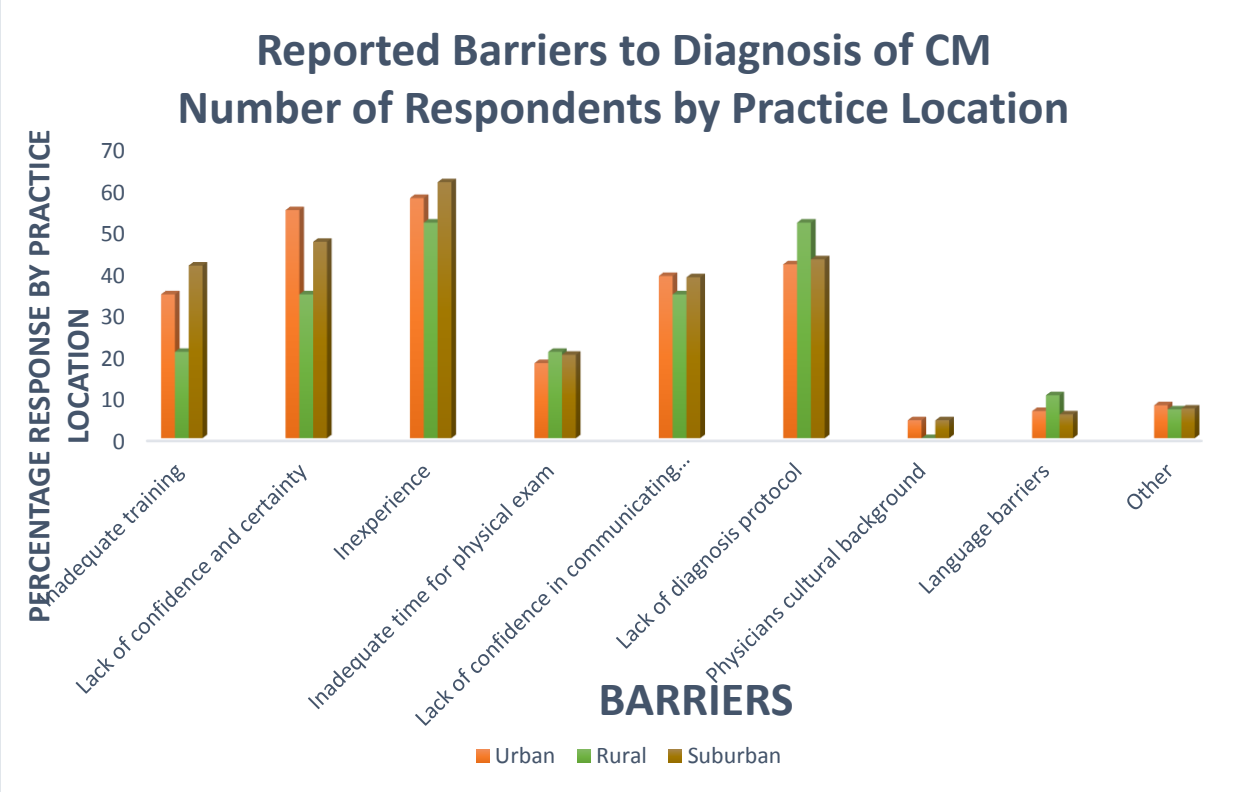
20.7% of physicians in the rural area cited inadequate professional training as a barrier, 41.4% and 34.5% cited inadequate professional training for suburban and urban practice locations respectively. Other barriers listed by location can be seen on Table 5b.

TABLE 6b: **Barrier to Diagnosis of CM by Practice Location.**

Barrier to diagnosis of child maltreatment		**Which of the following describes your practice location?**			
		Urban	**Rural**	**Suburban**	**Total**
	Inadequate training (% by practice location)	48 (34.5%)	6 (20.7%)	29 (41.4%)	83 (34.9%)
	Lack of confidence and certainty (% by practice location)	76 (54.7%)	10 (34.5%)	33 (47.1%)	119 (50.0%)
	Inexperience (% by practice location)	80 (57.6%)	15 (51.7%)	43 (61.4%)	138 58.0%)
	Inadequate time for physical examination (% by practice location)	25 (18.0%)	6 (20.7%)	14 (20.0%)	45 (18.9%)
	Lack of confidence in communicating with parent (% by practice location)	54 (38.9%)	10 (34.5%)	27 (38.6%)	91 (38.2%)
	Lack of diagnosis protocol (% by practice location)	58 (41.7%)	15 (51.7%)	30 (42.9%)	103 (43.3%)
	Physicians' cultural background (% by practice location)	6 (4.3%)	0 (0.0%)	3 (4.3%)	9 (3.8%)
	Language barrier (% by practice location)	9 (6.5%)	3 (10.3%)	4 (5.7%)	16 (6.7%)

	Other (% by practice location)	11 (7.9%)	2 (6.9%)	5 (7.1%)	18 (7.6%)
	Total	139	29	70	238

FIGURE 2: Reported Barriers to Diagnosis of CM by Practice Location



Adequacy of Training: Table 7

Although the barriers to early diagnosing of child maltreatment vary across training levels, more than one-third of the survey respondents agreed that family medicine physicians lack adequate training in the evaluation and diagnosing of child maltreatment. Out of the 245 (95%) of those who responded to the question about CM training adequacy, 34.7% agreed or strongly agreed that FMPs are inadequately trained to evaluate and diagnose CM, 38% neither agreed or disagreed with only 27.4% reporting that they disagreed or strongly disagreed with this statement.

Other Subspecialties: Table 7

The survey asked whether other subspecialties in addition to FM should evaluate, diagnose and manage CM; out of the 245 who responded to this particular question, 35.5% agreed with the statement and 34.3% strongly agreed, 14.3% neither agreed nor disagreed while only 10.2% disagreed with the statement.

Table 7: Adequacy of CM Training and Evaluation, Diagnosis and Management by other Sub-specialties

		Which of the following describes your practice level?				
		PGY1	**PGY2**	**PGY3**	**Post Residency**	**Total**
FMPs do not receive adequately training in CM evaluation, diagnosis, and management	Strongly disagree	2	2	2	5	11 (4.5%)
	Disagree	10	10	14	22	56 (22.9%)
	Neither	25	16	16	36	93

	agree/disagree					(38%)
	Agree	13	19	13	32	77 (31.4%)
	Strongly agree	2	0	2	4	8 (3.3%)
Total		52	47	47	99	245
Evaluation and diagnosis of child maltreatment should be carried out by other sub-specialties in addition to FM	Strongly disagree	2	4	1	7	14 (5.7%)
	Disagree	4	4	7	10	25 (10.2%)
	Neither agree/disagree	9	11	5	10	35 (14.3%)
	Agree	13	13	19	42	87 (35.5%)
	Strongly agree	24	15	15	30	84 (34.3%)
Total		52	47	47	99	245

Responders' Recommendations: Table 8 & Figure 3

Responders gave various recommendations on how to improve their competence and confidence level in diagnosing and managing CM among family medicine physicians as shown in Figure 3. Most of their recommendations were related to improving or providing one form of CM training to family medicine physicians. A majority of the responders (89.7%) recommended improving CM training during residency training period, 70.4% recommended offering CM Continuing Medical Education (CME) courses to family medicine physicians, and 21.4% recommended developing family medicine CM sub-specialty training. Some of the responders (3.7%) gave other recommendation such as:

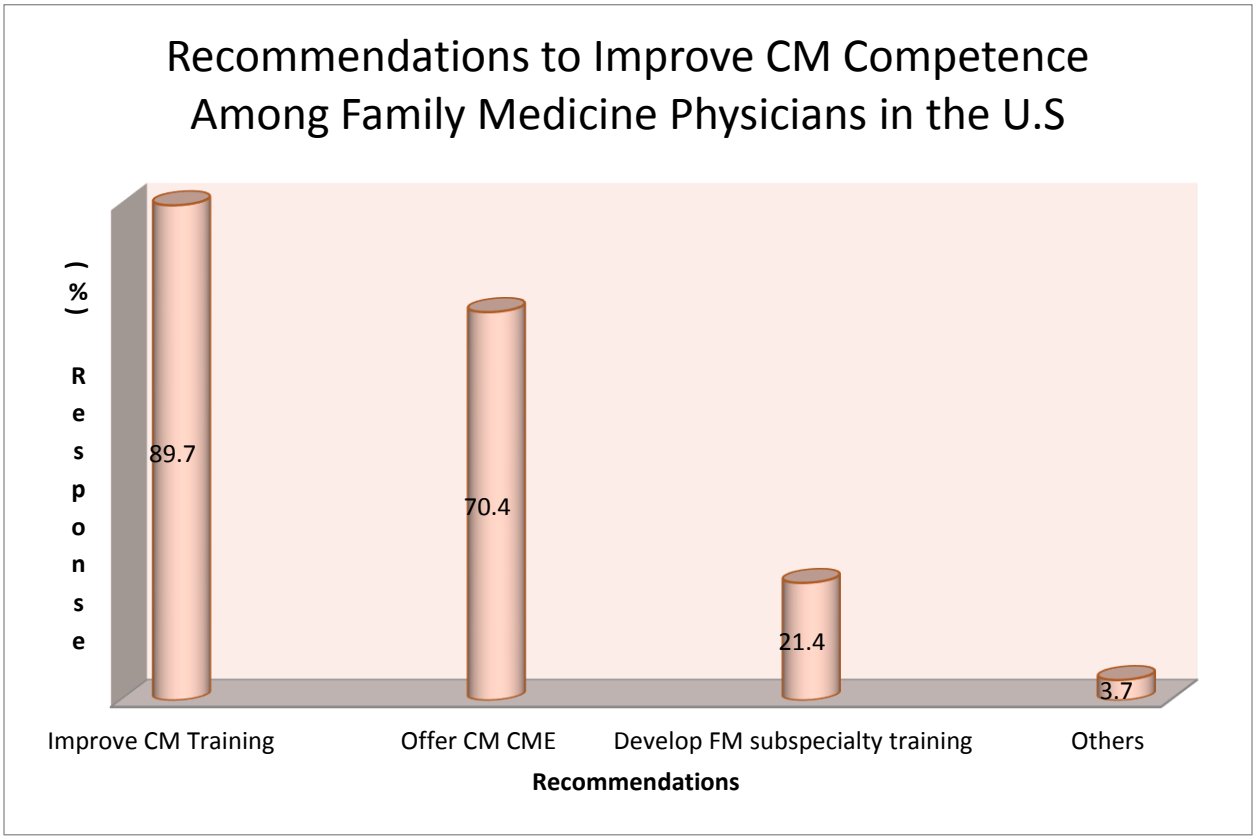
1. Providing good screening resources for front office clinical staff as part of the pre-examination assessment, for identifying at-risk children.
2. Initiating CM interviewing skill training in medical school before starting residency.
3. Developing CM family interview simulation program during residency training.
4. Developing CM evaluation and treatment protocols for clinicians.
5. Expanding access to referral for definitive assessment and management of maltreated child in difficult cases.

Recommendation break down based on practice level and practice location can be seen on Table 8 below. For recommendations each responder as displayed in Figure 3 was able to choose more than one recommendation; hence the total percentage by response type was more than 100%.

Table 8: Recommendations to Improve CM Competence

Recommendation to Improve CM Competence					
Practice Level		**Improve CM Training During Residency**	**Offer CM Continue Medical Education Courses**	**Development of Family Medicine Sub-Specialty Training**	**Other**
	PGY1	44(84.6%)	37 (71.2%)	8 (15.4%)	0 (0%)
	PGY2	46 (97.9%)	29 (61.7%)	16 (34.0%)	1 (2.1%)
	PGY3	44 (95.7%)	37 (80.4%)	10 (21.7%)	0 (0%)
	Post-residency	84 (85.7%)	68 (69.4%)	18 (18.4%)	8 (8.2%)
	Total	218 (89.7%)	171 (70.4%)	52 (21.4%)	9 (3.7%)
Practice Location	Urban	122 (87.8%)	102 (73.4%)	36 (25.9%)	7 (5.0%)
	Rural	27 (90.0%)	19 (63.3%)	3 (10.0%)	0 (0%)
	Sub-urban	69 (93.2%)	50 (67.6%)	13 (17.6%)	2 (2.7%)
	Total	218 (89.7%)	171 (70.4%)	52 (21.4%)	9 (3.7%)

Figure 3: Recommendation to Improve CM Competence



DISCUSSION

The purpose of this study was to demonstrate FMPs' confidence and competence level in CM evaluation and diagnosis. Early and correct identification of signs and symptoms of CM including all forms of abuse and neglect is important in attaining primary prevention to ameliorate the long-term consequences of CM. Family Medicine Physicians (FMPs) should play a major role in identifying and reporting cases of CM before the child presents to the emergency department for a more serious complication.

The majority of the physicians surveyed were not as familiar with diagnosing child maltreatment; 23.3% were familiar with a diagnosis of child maltreatment while the rest were somewhat familiar, somewhat unfamiliar or not at all familiar; perhaps their lack of familiarity is due to lack of confidence. Familiarity mostly increases as the level of training increases from a physician in training to post-residency physicians; this might be due to practice experience over time suggesting that their confidence level increases based on years of practice.

Competence level is average across all training levels. 74% of all responders have average competence level, but only 8% reported their competence level above average. It is possible that higher competence level among these physicians would improve frequency, timeliness, and confidence in CM diagnosis, evaluation, and management. Note that competence level increases as the year of training and practice increases, indicating the importance of training and experience in CM evaluation and diagnosis.

While most of these clinicians responded that their diagnosis of child maltreatment was timely, the majority of the survey respondents diagnose child maltreatment less frequently. The frequency of diagnosis is lowest among PGY 1 residents and highest among post-residency physicians, again supporting the hypotheses that the higher the level of training and relative increase in years of experience, the better their confidence and competence level in evaluating and diagnosing child maltreatment.

While various barriers to the diagnosis of child maltreatment were listed by the clinicians surveyed, those barriers that stood out were inexperience, lack of confidence and certainty about diagnosis, lack of diagnosis protocol, inadequate training, and lack of confidence in communicating with parents of maltreated children . These barriers indicate the need to improve CM training among FMPs and physicians in training.

Over one-third of the responders (34.9%) agreed that they are inadequately trained to evaluate, diagnose and manage CM. When this barrier to diagnosis was broken down based on practice level; the variation in response by practice level was inconsistent, i.e., response to the inadequacy of training neither increases nor decreases across practice level. However, when looking at inexperience as a barrier to diagnosis of CM, it decreases as the practice level increases; 76.5% of PGY 1 resident cited inexperience as a barrier, 68.9% of PGY 2 and 60.9% of PGY 3 resident cited inexperience as a barrier while only 41.7% of post-resident physician cited inexperience as a barrier; this might suggest that their inexperience is due to inadequacy of training. When the barrier to the diagnosis of CM was broken down by practice location, practices in the rural location seem to have fewer barriers to diagnosis of CM when compared to the urban and suburban practices. "Inexperience" was cited by 51.7% of rural practice physicians, 57.6% of urban practice physicians and 61.4% of physicians in suburban location. Inadequate professional training was cited by 20.69% of rural area physicians, 34.5% of urban practice physicians and 41.4% of suburban physicians cited inadequate training as a barrier to the diagnosis of CM. Variation in rural location vs. urban and suburban might be due to shortage of specialized physicians in the rural locations, [25] hence family medicine physicians in rural locations are compelled to learn all aspects of medicine including care for a maltreated child since they are more likely to encounter CM cases due to limited numbers of physicians in the rural areas.

Lack of protocol in the diagnosis of CM was another barrier listed by clinicians across all practice level; it was cited by 43.3% of all responders. When "Lack of protocol in the diagnosis of CM" was broken into practice location, 51.7% of rural practice physicians cited this as a barrier, 41.7% of urban practice physicians and 42.9% of suburban practice physicians cited this as a barrier to the diagnosis of CM.

Although "Lack of protocol in the diagnosis of CM" barrier is highest among rural practice physician, it is relatively high in urban and suburban practice as well indicating the need to develop a standardized evaluation and diagnosis protocol for CM among FMPs. Developing CM diagnosis protocol by the American Association of Family Physicians (AAFP) will go a long way in improving confidence in the diagnosis of CM as well; this ensures that all physicians follow the same diagnostic protocol across practice level and location.

Regarding diagnosing of CM, the majority of the family medicine physicians and physicians in training responded that another subspecialty, in addition to FMPs, should carryout evaluation and diagnosis of CM. Perhaps this is due to their lack of confidence in diagnosing CM, which could be in turn due to inadequate CM evaluation, diagnosis, and management training.

Various literature suggests directly or indirectly that inadequacy of training is a risk factor to misdiagnosing CM. Jackson et al. in their (Curiosity and Critical Thinking) article indicated that lack of good history taking from a verbal child, inadequate physical examination, and unrecognized symptoms constellation were the risk factors for missed diagnosis of CM at Children's Medical Center emergency medicine department. [26]

Similarly, Thorpe et al. reviewed missed opportunities to diagnose CM at the "Children's Hospital Pittsburgh" of the "University of Pittsburgh Medical Center"; they concluded that taking a good history and physical exam might have prevented missed cases of CM in this facility. [27] Perhaps these findings are due to the inadequacy of clinicians' CM training.

Menoch et al. also carried out a study of pediatricians in an urban, tertiary care facility to evaluate their medical knowledge in CM management; their result indicated an overall lack of clinician's knowledge in child abuse management, supporting the need for CM education for clinicians. [28] Lane et al. in 2009 surveyed U.S pediatricians to determine their experience, comfort and competence level in evaluating and managing CM. They concluded that most of their responders felt less competence in evaluating and managing CM and indicated the need for a pediatric medicine sub-specialty in CM field. [29] All these studies support the hypothesis that primary care clinicians such as FMPs will benefit from training in CM evaluation, diagnosis, and management to enable and ensure prompt and correct diagnosis. [26-29]

Although this current research undertaken in 2015 shows the importance of improving child maltreatment training among family medicine clinicians, there are some limitations to this study. While the response rate for this study was 61%, the sample size is not a representative of all FMPs, this is partly due to the fact that most of the clinicians who responded (94%) were from academic or residency institutions with very few in private or another practice type. Increasing the sample size could potentially increase the power of this study and increase reliability. Family medicine physicians from all regions of the U.S. were surveyed to improve the power and reliability of this study.

Another limitation of this study is not employing a standardized and validated assessment to measure responders' competence level in diagnosing and evaluating CM, as responders self-reported their level of competence. Hence, the level of competence as observed in this study might have been overestimated.

RECOMMENDATIONS

Based on my findings and the literature reviewed I will recommend to the family medicine directors and residency training program directors across the state of North Carolina to introduce CM training into the family medicine residency training curriculum. This training should be based on the different categories of child maltreatment such that each PGY levels attend different training at a point in time during their rotations . This training will involve completion of an online CM history taking and physical examination modules by residents based on a standardized self-assessment protocol set up by AAFP, as well as initiating a CM rotation where residents can shadow an expert to bolster their knowledge and confidence in CM evaluation and diagnosis.

CONCLUSION

Child Maltreatment is a major healthcare and public health problem in the U.S. Early and correct diagnosis of CM is essential in preventing further maltreatment that can eventually lead to morbidity and mortality. Family medicine physicians as primary health care providers play a crucial role in the evaluation and assessment of these children. However, due to inadequate training they lack confidence in evaluating and diagnosing maltreated children.

Initiating child maltreatment evaluation and diagnosis training early during family medicine training will go a long way in improving their confidence and subsequently competence in CM evaluation, diagnosis, and management.

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APPENDIX 1: SYSTEMATIC REVIEW

Objectives and Concepts

The main object of this paper is to elicit or demonstrate family medicine primary care physician's confidence and competence in making a prompt diagnosis of suspected child maltreatment case and to determine the barrier to early diagnosis or accurate diagnosis of suspected child maltreatment that include neglect, physical abuse, sexual abuse and emotional abuse. I researched and reviewed journal articles related to health care, mental health, family medicine, emergency medicine and pediatrics. It was a bit challenging to obtain reasonable articles with search criteria focus on family medicine physicians hence research criteria were broadened to include emergency medicine and pediatric articles. Any form of publications including clinical trials, systematic review and research articles, etc. was included in the literature research.

Current articles mostly from the year 2009 to 2015, i.e., the last six years, was researched since searching articles more than six years old brought up a large number of articles that were not quite relevant to this project. Initially various search engines were used which include "Google Scholar, PubMed, EBSCO Host, CINAHL and Social Work Reference Center" this was eventually narrowed down to only two search engines i.e., PubMed and EBSCO Host. Pediatrics Emergency Care Journal, was specifically reviewed for articles as well since a lot of maltreated children also present at the pediatric emergency departments.

Challenges faced during this systematic review process were unlimited. Initially, the search criteria were focused on family medicine physicians, but due to inability to obtain relevant articles the search criteria were broadened to include health care, emergency medicine, and pediatrics.

It was also quite difficult to obtain an article that addresses all types of child maltreatment, most of the articles reviewed were on physical abuse with very few encompassing all forms of CM.

Search Criteria

Search Engine: PubMed.

Search Start Date: Oct 2015.

Search Criteria and Term :((("Delayed Diagnosis"[Majr]) OR "Diagnostic Errors"[Majr])) AND ("Child Abuse/diagnosis"[Majr].

This search term returned 36 articles, which was further filtered by reviewing articles written in English, published in the U.S. and published six years ago or less. With these criterions, the articles returned were reduced to 13.

Another search criteria and the term used on PubMed was “Evaluation and Management of Child Maltreatment” this search term produced 531 articles, this was further narrowed down to 222 articles when I used criteria such as year of publication of six years or less and only English, U.S. published journals.

Search Engine: EBSCOHost.

Search Start Date: Oct 2015.

Search Criteria and Term: “child abuse” AND “diagnostic error” OR “delayed diagnosis” OR “misdiagnosis” AND “physicians”.

This search criteria and terms returned 3,913 articles; I further restricted the search criteria to articles six years old or less which returned 2,355 articles. Other criteria later added in the search was an article written in English and published in the U.S. After including all these search criteria, EBSCOHost returned 1,182 articles.

Search Journal: Pediatric Emergency Care Journal.

Search Date: Nov 2015

Search Term: "Missed Opportunity", "Child Physical Abuse" "Fatal Child Abuse" "Misdiagnosis of Child Abuse".

This search strategy returned 53 articles related to missed diagnosis of child maltreatment. Articles were selected based on recent publication six years old or less, published in English in the U.S. After combing through most of the returned articles, the ones that are relevant to this project were selected, most of which appear in both PubMed and EBSCOHost search engine as well as the Pediatric Emergency Care Journal.

Article Review Summary

Jackson AM, Deye KP, Halley T, et al. Curiosity and critical thinking: Identifying child abuse before it is too late. *Clinical Pediatrics*. 2015;54(1):54-61.

Study Description: Review of medical records at Children's National Medical Center in Washington, DC in a level 1 trauma center; to identify factors contributing to missed cases of child abuse at their initial presentation at the trauma center. They reviewed medical records over a 12-year period (2000-2012), and the review team includes three physicians (a child abuse pediatrician, a pediatric hospitalist, and a pediatric emergency medicine physician). The review team obtained medical records of patients diagnosed with child abuse as well as records of previous visits where they missed signs of child abuse. They also determined the cause of missed diagnosis at their initial visit.

Study Population: Children ages five weeks to 7 years old who were evaluated at Children's Medical Center emergency department at least once before their diagnosis of child maltreatment.

Study Design; Retrospective Cohort Study.

Study Result: Out of a total of 18 patients reviewed almost all had an ED evaluation for their diagnosis of child maltreatment at some point. Out of these 18 children, 15 were given a different diagnosis other than child maltreatment such as fracture, contusion, overfeeding, sepsis, etc., only 3 of the 18 children had suspected diagnosis of maltreatment, but these three cases were never reported to the child protective service. Of the 18 children, a report of two fatalities was made with one of the two children who were dead on arrival at the hospital.

Some of the factors contributing to misdiagnosis in this institution include lack of history taking from verbal children occurring in 11% of the cases; inadequate physical examination in 50% of cases (improper documentation of skin findings); and unrecognized symptoms constellation in 17% of cases. Other factors include not following maltreatment pathways or established guidelines in 33% of cases; not ordering appropriate radiologic testing were, and missing radiologic findings in 11% and 17% of cases respectively; lack of time to review medical record in 11% of cases and lack of access to previous medical record in 28% of cases.

Study Limitation/Strength: One of the strengths of the study is the involvement of a well-trained CM pediatrician in reviewing records.

Limitations include a small sample size of cases reviewed; 18 cases are quite small, and this might affect the power and value of the study. The selection process improperly discussed; it is unclear if cases were randomly selected to eliminate selection bias. There were limitations in accessing medical records from previous visits due to lack of electronic medical record which the institution did not have until the year 2010. Hence, there might have been an underestimation of the total number of missed cases of abused child.

Thorpe EL, Zuckerbraun NS, Wolford JE, Berger RP. Missed opportunities to diagnose child physical abuse. *Pediatr Emerg Care*. 2014;30(11):771-776.

Study Description: This study was designed to identify incidence of missed opportunity to diagnose a case of child abuse among children who presented with healing bone fracture related to abuse at various locations (emergency department, primary care offices and subspecialty practices) of the "Children's Hospital Pittsburgh" of the "University of Pittsburgh Medical Center" .

This study involves reviewing of medical records of all children who underwent a skeletal survey due to concern for physical child abuse over a seven yr period from April 1, 2002, to March 31st, 2009. The child protection team obtains a history and physical exam from subject's caretakers as well as their primary care providers in addition to record review. They collected two sets of data; the first set of data includes history and physical examination for the visit at which the abuse was diagnosed, and the other data is from the previous visit before the abuse was diagnosed. They defined previous visit as any visit to the health care provider within six months of abuse diagnosis other than for well child care and all previous visits were classified as missed previous visits in which potential abuse fracture was missed or a previous unrelated visit.

Study Population: Children ages range between 0.5-70.3 months who presented at the "Children's Hospital Pittsburgh" of the "University of Pittsburgh Medical Center" with the skeletal survey with healing fracture attributed to physical abuse. 49% of these children were female while 51% of them were male.

Study Design: Retrospective descriptive study.

Study Result: They included 1,466 subjects who had a skeletal survey performed due to concern for abuse initially. Out of these total numbers, 5 were excluded for healing skeletal survey performed more than seven days after presentation while 1,361 subjects had no healing fracture leaving only 100 subjects with a healing fracture on their skeletal survey. Out of these 100 subjects, 23 were excluded since they had non-physical abuse related fracture i.e., 77 subjects have a healing fracture on radiology assessment and diagnosis of abuse by the child protective team consensus and were eligible for chart review.

Out of 77 subjects 37 (48%) had previous visits, 16 (20%) had two or more previous visits and 27 (33%) had one missed previous visits. This study suggested that 43% of subjects presented with signs related to trauma or for the history of trauma (20%), 10% had a nonspecific presentation, 9% were referred for evaluation, 9% had an apparent life-threatening event, 8% had a seizure while 1% had increased occipitofrontal head circumference. Based on dermatologic or skin evaluation, 74% had signs of skin trauma, 33% had skin bruises, 27% had swelling, 9% had combined swelling and bruising while 5% had epistaxis, torn frenulum, palpable chest-wall crepitus and mouth bleeding. These findings suggested that good history is taking and physical examination might prevent repeat exposure of a child to abusive injury which will subsequently prevent morbidity and mortality associated with physical abuse.

Study Limitation/Strength: There are various strengths of this study that include the use of PSS 19.0 for all data analysis, the use of kappa statistic to assess interrater reliability to determine missed or unrelated previous visit, this value was 0.94 which strongly correlates with the 95% confidence interval used and P value less than 0.05.

The following are the limitations of this study: due to retrospective data collection, data extractor was used to assess some variables such as the reason for presentation at a previous visit that could cause bias in classifying previous visits as either missed or unrelated. There was also missing data from the previous visit with an increased likelihood of underestimating missed previous visits.

Menoch M, Zimmerman S, Garcia-Filion P, Bulloch B. Child abuse education: An objective evaluation of resident and attending physician knowledge. *Pediatr Emerg Care*. 2011;27(10):937-940.

Study Description: This study was carried out over a 3-month period (July-September, 2008) among pediatric residents, pediatric faculty and pediatric emergency medicine faculty in an urban, tertiary care facility to evaluate their medical knowledge of child abuse and maltreatment by survey administration by a convenient sampling of the population listed. Survey was sent out initially electronically via email, and the hard copy was later distributed among clinicians during conferences two months later. This survey consists of thirty questions developed by the hospital forensic department medical director and screened by two clinicians who are experienced in child abuse. They focused survey questions mainly on signs of physical and sexual abuse, dermatologic history, radiologic findings, abusive head trauma, risk factors for abuse, mechanism of injury, etc. They also asked questions regarding previous education in child abuse, the question about resident's level of training and clinician's specialty. Hey scored answers to questions over 100% as either correct or incorrect such that a mean score of 67% will correspond to a score of 20 out of 30 questions.

They stratified overall survey response into different categories (pediatric and medicine resident, pediatric resident, a general pediatrician and emergency medicine pediatrician) and score comparison across each stratum was done using Kruskal-Wallis test of equality of population. The alpha level of 0.05 with 2 sided alternative hypotheses was deemed statistically significant, and they completed data analysis by Stata SE 8.0 (College Station, Tex).

Study Population: Pediatric residents, pediatric faculty and pediatric emergency medicine faculty in an urban, tertiary care facility.

Study Design: Cross-sectional study design.

Study Result: Out of 95 responders 61 (64.2) were residents, 18 (19%) were general pediatricians, and 16 (16.8%) were pediatric emergency medicine physicians. Each question response was scored as either correct or incorrect with residents mean score of 60.4% (SD,12.9) with no difference in score based on resident's year of training (P=0.076). Both general pediatricians and pediatric emergency medicine physicians had a mean score of 66.7% (SD, 12.4) and 76.9% (SD, 9.1) (P=0.018) respectively. The difference in the knowledge of child abuse and neglect across physician categories was statistically significant with a P value of < 0.001). The overall mean score for this study was 63.3% (SD,13.8%) i.e., a score of 19 out of 30 questions which is less than the expected overall mean of 67% i.e., a score of 20 out of 30 indicating overall lack of clinician's knowledge in child abuse supporting the need for child abuse education.

Study Limitation/Strength: The strength of this study is the use of Kruskal-Wallis test of equality of population to compare scores across each stratum of medical practice i.e., residents' vs. practicing general pediatricians' vs. pediatric emergency medicine physicians.

Also, the difference in the knowledge of child abuse and neglect across physician categories was statistically significant with a P value of < 0.001).

The limitations of this study include lack of use of the consistent method to administer survey questions; some questions were answered via email with no 3rd party supervision hence giving responders time to look up answers to questions unlike the other group who completed hard copy survey, this might lead to response bias. This study was also carried out in a single academic institution therefore the result cannot be generalized to all settings.

Lane WG, Dubowitz H. Primary care pediatricians' experience, comfort, and competence in the evaluation and management of child maltreatment: Do we need child abuse experts? *Child Abuse Negl*. 2009;33(2):76-83.

Study Description: This study was conducted among U.S. based pediatricians to assess their experience, comfort, and competence in evaluating and managing child maltreatment, rendering an opinion about a case of child maltreatment and needing expert opinion in evaluating and management of child maltreatment. The survey was mailed to 530 pediatricians across the U.S. randomly selected from the "American Academy of Pediatrics (AAP)" membership roster. They divided the survey questions into three sections. The first section asked about the frequency of evaluation of children with maltreatment and how often they report suspected cases, this section also asked if clinicians required the use of abuse specialist. The second section asked about pediatricians' knowledge, comfort, and competence in child maltreatment management and the last section asked mainly demographic questions such as age, sex, race, ethnicity, year of practice and the total time spent in primary care. Factors that predict pediatrician's competence was assessed using logistic regression while controlling for significant covariates.

Study Population: Practicing pediatricians in the U.S.

Study Design: Cross-sectional study design.

Study Result: 278 (53%) survey was completed and returned out of the 520 survey mailed. Out of the 278 returned survey, 101 were completed by retired pediatricians hence were excluded from the study, an additional 30 survey were returned blank leaving a total of 147 (28%) surveys eligible for analysis.

Regarding evaluation and reporting of child maltreatment, ¾ of all suspected physical and sexual abuse were reported to CPS (Child Protective Service) while ½ of all suspected neglect was reported indicating little experience in their evaluation and reporting of suspected child maltreatment.

The total number of pediatricians who had evaluated at least one patient for physical abuse was 97 and of these 97 physicians, 78 (80%) indicated they had access to expert consultation, and 64% of all suspected case of physical abuse was referred to an expert in the field of child abuse. A total of 83 pediatricians indicated they evaluated, at least, one case of sexual abuse, 74 (89%) of which had access to expert consultation and 54 (73%) referred these cases to an expert. A total of 92 pediatricians had evaluated at least one patient with suspected neglect, 69 (76%) of which had access to expert consultation and 57% of all patient evaluated were referred to an expert. Out of all pediatricians who responded to the survey, 94.5-98.6% agreed or strongly agreed on the need for primary care providers to receive training in the evaluation of child maltreatment.

Regarding reporting of suspected child maltreatment, only 84% of responders reported their suspected cases of neglect even though 94% of them stated they usually report suspected cases of abuse. In general, most responders felt less competent in evaluating, reporting, retendering opinion regarding child maltreatment and indicated the need for a pediatric subspecialty in child maltreatment field.

Study Limitation/Strength: The use of multivariate logistic regression analyses to evaluate factors influencing pediatricians' sense of competence with medical evaluation, rendering of opinion, testifying in court and preference to refer to an expert is one of the strengths of this study, also, risk for selection bias was low since questionnaires were mailed randomly to 520 pediatricians in the U.S.

There were various limitations of this study; there was an insufficient number of responders, out of 520 questionnaires mailed out only 147 (28%) were returned and completed; this was attributed to the selection process since the AAP did not specify whether or not the pediatricians are still practicing. There is the possibility of response bias since the number of child maltreatment seen or referred by pediatricians was self-reported, this could have been eliminated if this information was obtained from a registry.

APPENDIX 2: SURVEY

Family Physician Competency in Evaluating and Diagnosing Child Maltreatment

Q1 My name is Kehinde Eniola, MD a practicing family physician and an MPH candidate at the University of North Carolina, Chapel Hill. The purpose of this survey is to obtain information from family physicians about the diagnosis of child maltreatment. This survey will take approximately 2 minutes to complete. It is anonymous and no personally identifying information will be collected. I appreciate your honest responses to each of the following questions. Data will be summarized to inform medical education efforts. No institutional nor programmatic educational information is being collected. By continuing to the next page, you voluntarily consent to participate.

Q2 What field of medicine do you practice?

- Family Medicine (1)
- Other (2)

If Other Is Selected, Then Skip to End of Survey

Q3 Which of the following describes your practice level?

- PGY1 (1)
- PGY2 (2)
- PGY3 (3)
- Post Residency (4)

Q4 What is your gender?

- Male (1)
- Female (2)
- Transgender (4)
- Prefer not to say (3)

Q5 What age range do you belong?

- Less than 20 (1)

- 20 - 29 (2)
- 30 - 39 (3)
- 40-49 (4)
- 50-59 (5)
- 60 and above (6)

Q6 What is your race?

- White/Caucasian (1)
- African American (2)
- Hispanic (3)
- Asian (4)
- Native American (5)
- Pacific Islander (6)
- Other (7) _____
- Prefer not to say (8)

Q7 What is your practice type?

- Private Practice (1)
- Academic Institution/Residency Program (2)
- Government Hospital (3)
- Other (4) _____

Q8 What is your practice location?

- Urban (1)
- Rural (2)
- Suburban (3)

Q9 What US state is your practice located?

- Alabama (1)
- Arizona (2)
- Arkansas (3)
- California (4)
- Colorado (5)
- Connecticut (6)
- Delaware (7)
- District of Columbia (8)
- Florida (9)
- Georgia (10)
- Idaho (11)
- Illinois (12)
- Indiana (13)
- Iowa (14)
- Kansas (15)
- Kentucky (16)
- Louisiana (17)
- Maine (18)
- Maryland (19)
- Massachusetts (20)
- Michigan (21)
- Minnesota (22)
- Mississippi (23)
- Missouri (24)

- Montana (25)
- Nebraska (26)
- Nevada (27)
- New Hampshire (28)
- New Jersey (29)
- New Mexico (30)
- New York (31)
- North Carolina (32)
- North Dakota (33)
- Ohio (34)
- Oklahoma (35)
- Oregon (36)
- Pennsylvania (37)
- Rhode Island (38)
- South Carolina (39)
- South Dakota (40)
- Tennessee (41)
- Texas (42)
- Utah (43)
- Vermont (44)
- Virginia (45)
- Washington (46)
- West Virginia (47)
- Wisconsin (48)

- Wyoming (49)
- Puerto Rico (50)
- Alaska (51)
- Hawaii (52)
- Do not practice in the US (53)

If Do not practice in the US Is Selected, Then Skip to End of Survey

Q10 How familiar are you with the diagnosis of child maltreatment (Neglect, physical abuse, sexual abuse, and emotional abuse)?

- Not at all familiar (1)
- Somewhat Unfamiliar (2)
- Somewhat Familiar (3)
- Familiar (4)

Q11 How would you assess your competency level in evaluating and diagnosing suspected child maltreatment?

- Below Average (1)
- Average (2)
- Above Average (3)

Q12 Since practicing family medicine, how often do you diagnose child maltreatment (Neglect, physical abuse, sexual abuse, and emotional abuse)?

- Never (1)
- Once a Year or Less (2)
- Several Times a Year (3)
- Once a Month (4)
- 2-3 Times a Month (5)
- Once a Week (6)

- 2-3 Times a Week (7)
- Daily (8)

If Never Is Selected, Then Skip to What are your barrier to diagnosing o...

Q13 Would you say your diagnosis of child maltreatment was timely or late (i.e., diagnosed in the emergency room by an ER doctor)?

- Yes timely (1)
- No, late (2)
- I can't recall (3)

Q14 What are your barriers to diagnosing or early diagnosing of child maltreatment? Select all that apply.

- Inadequate professional training (1)
- Lack of confidence and certainty (2)
- Little experience in diagnosing and treating child maltreatment (3)
- Lack of adequate time for physical examination of maltreated child (4)
- Lack of confidence in communicating with parent of a child with suspected maltreatment (5)
- Lack of clinic protocol in diagnosis of child maltreatment (6)
- Physician's cultural background (7)
- Language barrier (8)
- Other (9) _____

Q15 Family Medicine physicians are inadequately trained to evaluate and diagnose child maltreatment.

- Strongly Disagree (1)

- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q16 Evaluation and diagnosis of child maltreatment should be carried out by other sub-specialties in addition to family medicine.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q17 Are you familiar with your state law regarding child maltreatment and reporting?

- Yes (1)
- No (2)

Q18 Do you know the reporting process for suspected child maltreatment cases?

- Yes (1)
- No (2)

Q19 How can family physician's competency in evaluating and diagnosis child maltreatment be improved? Select all that apply.

- Improve child maltreatment evaluation and diagnosis training during residency (1)
- Offer CME courses on child maltreatment evaluation and diagnosis for family physicians (2)
- Develop child maltreatment sub-specialty training for family physicians (3)
- Other (4) _____